Fatigue of LIGA Ni MEMS Structures

Wolé Soboyejo, Princeton Materials Institute,
Princeton University, DMR Award#0075135

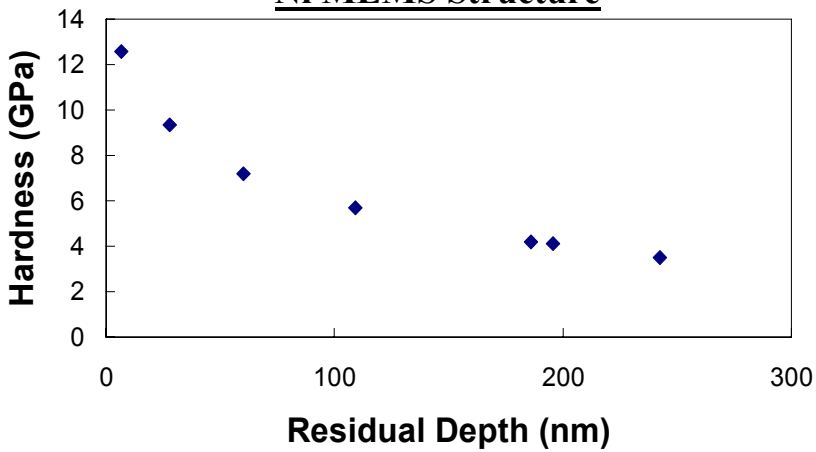
- **Significant progress in the study of nano-indentation size effects in LIGA Ni MEMS structures**
- **Size effects modeled using mechanisms-based strain gradient plasticity theory**
- **Pile-up phenomena (associated with indentation experiment)**
- **Fatigue micro-tester designed and built in the past year**

J. Lou, P. Shrotriya, S. Allameh, N. Yao, T. Buchheit, and W.O. Soboyejo, "Plasticity Length Scale in LIGA Nickel MEMS Structure" (Paper B2.5), *2001 Fall Meeting Symposium B, Volume 687* (Ranked No.3 in Most Downloaded Online Proceedings Papers for the year of 2002 Jan-April 206 downloads)

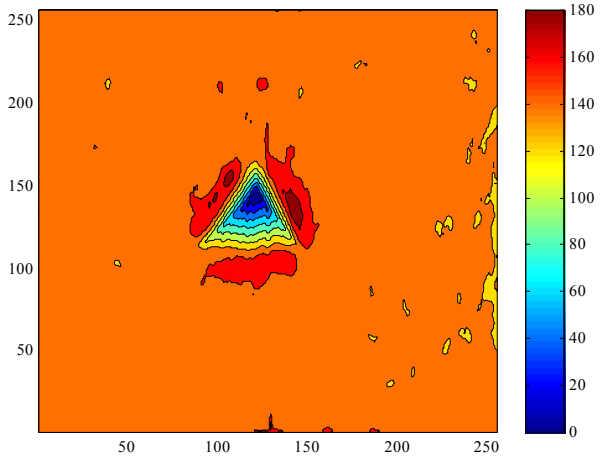
P. Shrotriya, S.M. Allameh, J. Lou, T. Bucheit and W.O. Soboyejo, "On the Measurement of the Plasticity Length-Scale Parameter in LIGA Nickel Foils", Mechanics and Materials Journal, 2001. (In Press*)*

J. Lou, P. Shrotriya, T. Buchheit, D. Yang and W.O. Soboyejo, "A Nano-Indentation Study of Plasticity Length Scale Effects in LIGA Ni MEMS Structures", Journal of Materials Research (Submitted)

Size-Dependence of Hardness in LIGA Ni MEMS Structure



Pile-up Across Nano-Indentation



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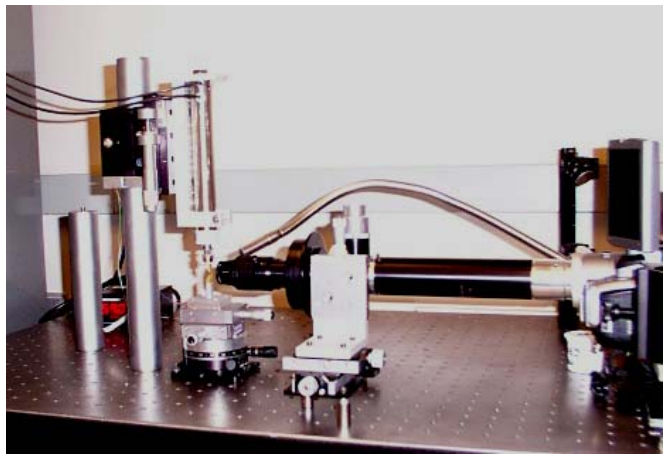
Brief Summary of Outreach Activities

- Focus on under-represented minorities and women
- Organized two workshops for minority high school students to introduce materials science
- 2 minority students hired to work in the summer of 2001
  - Adler Perotte (length-scale effects)
  - Seye Tairu (microstructural characterization)
- 1 female graduate student
  - Verna Lomax
- 1 male graduate student
  - Jun Lou (passed PhD general exam)
- Post-doctoral researcher (Pranav Shrotriya) and Staff Scientist (Seyed Allameh) have participated in research
- Developed new graduate course on MEMS
  - co-taught with Dr. Azzam Yassen of Orchid Bioscience

Fatigue Micro-Tester



FIB Image of Microstructure of LIGA Ni MEMS (Cross-section)